Lassonde School of Engineering
Department of Earth and Space Science and Engineering
Geomatics Engineering

LE/ESSE 4650 – Hydrography
Winter 2022

LAB # 5: Processing of Multi Beam Echo-Sounding Data (100)
Part B: Generation of Georeferenced Bathymetry

Assigned: **March 11, 2022**
Due: **March 22, 2022**

Objective:
The objective of this lab is to acquaint students with processing of data from a multibeam echosounder using the CARIS HIPS and SIPS application software.

The processing of multi beam data will be performed in three parts.

Part A: Data import and Project Creation
Part B: Generation of Georeferenced Bathymetry
Part C: Generation and Export of Bathymetric Products

This lab covers **Part B: Generation of Georeferenced Bathymetry**.

Data and associated information:

You are provided with the following dataset:
- *Teledyne RESON SeaBat 7125, Multibeam Sonar, 512 beams.*
- *Vessel: FA_2807_Reson7125*
- *Date Collected: March 31, 2011 and April 01, 2011 (JD 2011-090 and 2011-091).*

Preprocess and Background data (Relevant Ancillary Data)

i. **Raw Data files for Conversion – Hypack Data** (*.RAW or *.HSX)
ii. **Background -** (*.KAP and *.000)
iii. **Applanix Ancillary Data**
- **Delayed Heave:** *2011_090_2807.000 and 2011_091_2807.000*
- **Navigation =** *2011_090_2807.sbet and 2011_091_2807.sbet*
- **Real Time Uncertainty data =** *2011_090_2807.smrmsg and 2011_091_2807.smrmsg*
- **SVP data** = *H12281_2807.svp*
- **Tide data:** *Seattle_9447130_20110318_20110502.tid*

Rawness of data

- Data are roll-compensated only, but not corrected for any other vessel motion.
- Offsets for navigation lever arms are compensated for in the POS/MV.
- Travel time and angle information is available.

Positioning information

- Data in geographic coordinates.
- **CRS** Pick **NAD83 / UTM zone 10N EPSG:26910**

IMPORTANT NOTE: The license for using the provided CARIS software and the provided datasets are only for the purpose of this lab assignment. Do not use or distribute any of the software, data or any related information outside this course.

SUBMISSION OF LAB TECHNICAL REPORT AND REQUIREMENTS:

1. Submit a detailed report to demonstrate and explain your understanding of the steps involved in data import and project creatin for the echo-sounding data. Additionally, you may utilize screenshots to show your results.

2. Provide a workflow chart of the steps undertaken.

3. Throughout this document, there are several requirements for lab submission. These are highlighted in **red** under the heading '**SUBMIT'**. Ensure these are requirements are also met and submitted along with your lab report.

Part B: Generation of Georeferenced Bathymetry

Data processing consists of the following steps:

Georeference Bathymetry: Georeferencing each sounding and these soundings are referred as processed depths in HIPS. It includes the following:

1. **Sound Velocity Correction**: Load and edit sound velocity profiles and apply the correction
2. **Load/Compute Tide**: Load tide data from one or more tide stations or compute GPS Tide
3. **Processing of vertical and horizontal information** to produce geo- referenced data.
4. **Compute Total Propagation Uncertainty (TPU)**: Utilize uncertainty values entered in the HVF in an effort to compute the total propagated uncertainty of each individual sounding

Task B1: Edit SVP, Add SVP Positions as Background data and Edit Tide

Task B1.1 Use SVP Editor to open sound velocity profiles

i. Click the SVP Editor icon or the **Tools > Editors > Sound Velocity Profiles** menu. Open the H12281_2807.svp in the SVP\CUBE\2807 directory. (Pages 95-96, Exercise 32)

Task B1.2 SVP Positions as Background Data

i. Select the **H12281_2807.svp** file from the **…\SVP\CUBE\2807** directory, and click **Open** (Page 96, Exercise 33).

ii. On the Layers window, select the **H12281_2807** layer and in the Properties window, change the Symbol **Colour** to **Blue**. Refresh the screen.

iii. Highlight the **H12281_2807** layer and select a few symbols in the Display window. Details will appear in the Selection window

Task B1.3: Edit the Tide editor

i. Click the Open icon or in the File > Open menu, to open the file **Seattle_9447130_20110318_20110502.tid** from the **…\Tide\CUBE\Verified directory** (Page 97, Exercise 34**).**

Deliverable B1 (20): Select a Sound velocity profile, comment on the SV-Depth relationship and provide a screen caption.

Deliverable B2 (15): Provide the sound speed at the following depths for the two profiles (2011/03/31 at 19:16:00, Lat: 47º 35’ 31”; Lon: -112º 34’ 46”) at 1.24m, 10.04m, 25.04m, 41.020m)

(2011/04/01 at 15:53:00, Lat: 47º 35’ 10”; Lon: -112º 34’ 43”) at 0.86m, 10.08m, 25.02m, 39.980m)

Deliverable B3 (15): Show the positions of the sound velocity casts on the map. Provide a screen caption.

Deliverable B4 (15): Provide the tide graphs for:

a) On Day 0 (March 18, 2011) at Time intervals (HH: MM): **00**:00 -12:00 and 00:00 - 24:00

b) An interval for five days (March 18 to March 23, 2011).

Task B2: Georeference Process - Vertical and Horizontal components

With the release of HIPS 11.0, there is a new process called **Georeference Bathymetry**, which in essence Georeference each sounding on the project and these soundings will be referred as processed depths in HIPS. It also allows executing another three processes optionally; Sound Velocity Correction, Total Propagated Uncertainty and Vertical Datum Reference.

There are two components to the Georeference Bathymetry process: Vertical and Horizontal.

Note:

Please make sure that all Single Beam SVP files and tide files are all removed before you begin with the Georeferencing process.

Task B2.1 Execute Sound Velocity Correction

i. Click on the **Georeference Bathymetry** icon or select **Tools > HIPS and SIPS > Georeference Bathymetry…** from the menu (Page 101, Exercise 35).

Active the checkbox **Sound Velocity Profile(s)**. Click on the + icon and select the file **H12281_2807.svp** on the folder **…\Training\HIPS\SVP\CUBE\2807** (Pages 104 - 105).

Task B2.2 Execute Total Propagated Uncertainty

ii. Click on the **Georeference Bathymetry** icon or select **Tools > HIPS and SIPS > Georeference Bathymetry** and check the option **Total Propagated Uncertainty**. TPU Options will appear on the options window. (Pages 105 - 106).

On **Measured Tide**, type **0.01 (m).**

On **Tide Zoning**, type **0.1 (m).**

On **Measured Sound Velocity** enter **0.2 (m/s).**

On **Surface Sound Velocity** enter **0.5 (m/s).**

Select these sources:

- Navigation Source: Realtime
- Sonar Source: Vessel
- Gyro Source: Realtime
- Pitch Source: Realtime
- Roll Source: Realtime
- Heave Source: Delayed

- Tide Source: Static

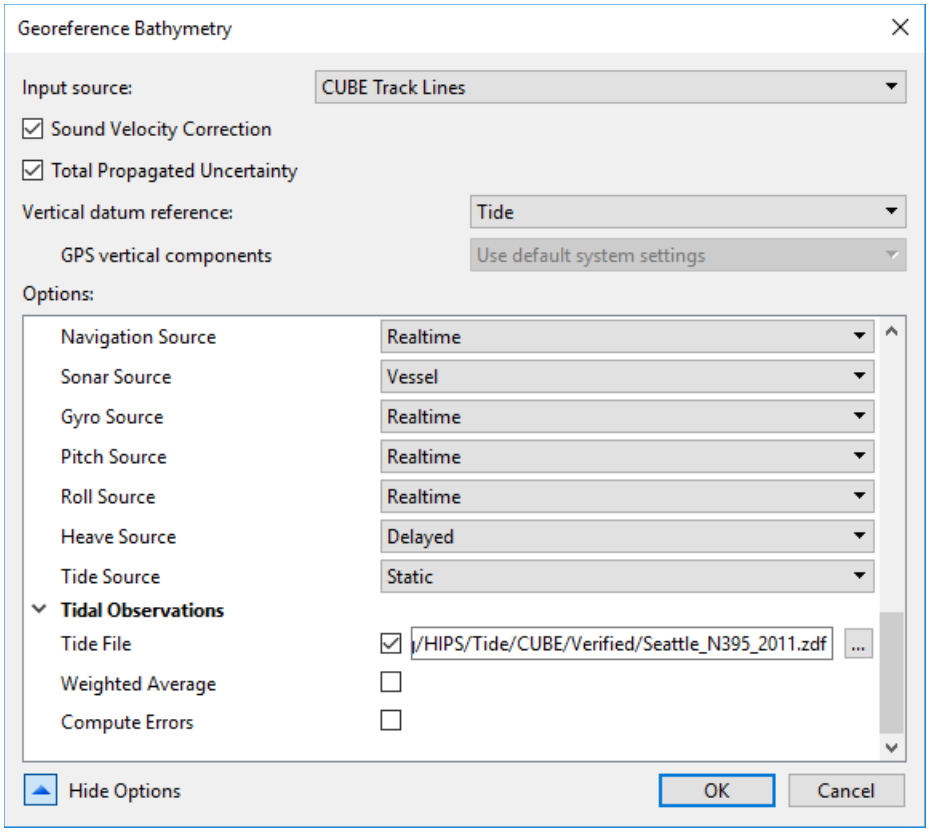
Deliverable B5 (20): What are the TPU components and how they are computed.

Task B2.3 Execute Vertical Datum Reference

You can choose from three different Tide Options from the Tide drop list in Georeference Bathymetry:
-None: With this option, no tidal correction will be applied (Zero Tide). This is the default setting.
-Tide: Options for Observed tidal corrections will be displayed.
-GPS: Options for GPS tidal corrections will be displayed.

On **Vertical datum reference**, select **Tide** from the drop list. **Tidal Observations** Options will appear on the options window. (Pages 109 – 110)

Active the Checkbox Tide File and select the file **Seattle_N395_2011.zdf** on the folder **…\Training\HIPS\Tide\CUBE\Verified**



Task B2.4: Apply SV Profile

Select the **All Track Lines** layer in the **Layers** window. Follow the procedure in Page 111 (Exercise 36).

Deliverable B6 (15): Colour survey lines based on which SV profile was applied to each line swath. Provide screen captions.
Show that the Geo reference and all corrections have been completed and provide the snapshot of the Selection window.

Task B2.5: Save your Project